PATENT ABSTRACTS OF JAPAN

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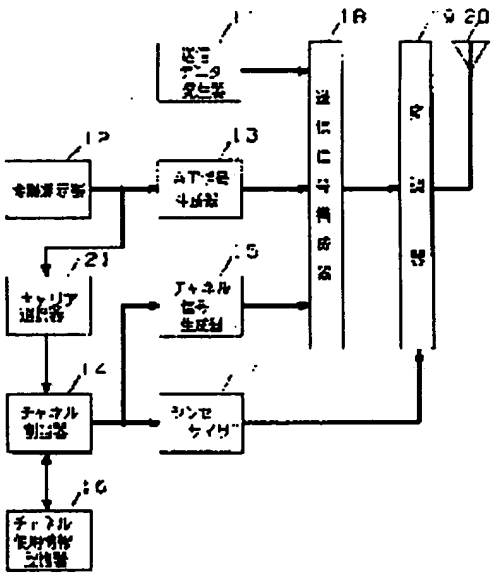
SAITO YOSHIKO
TSUBAKI KAZUHISA
HONMA KOICHI

(54) MOBILE COMMUNICATION METHOD AND ITS EQUIPMENT

(57) Abstract:
PURPOSE: To increase number of channels secured in a definite range of frequency band by dividing the frequency band into different carrier intervals and using each carrier interval for different channels.
CONSTITUTION: A carrier selector 21 selects carriers with a wide carrier interval when a distance between a base station and a mobile station is remote and selects carriers with a narrow carrier interval when the distance is small based on the measured distance. That is, the carrier selector 21 makes the carrier interval not constant and selects the carrier interval in use depending on the distance between the base station and the mobile station. When the mobile station is resident around the center of the cell, the carriers with a narrow carrier interval are selected and when the mobile station is resident around the edge of the cell, the carriers with a wide carrier interval are selected thereby increasing number of available carriers while keeping desired quality in all the carriers.



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CLAIMS

[Claim(s)]
[Claim 1] The mobile communications method which divides into a different carrier interval the frequency band used for communication between a base station and a mobile station, and uses each carrier interval as a channel different, respectively.
[Claim 2] It is mobile communications equipment equipped with the carrier selector which assigns the carrier of an interval small when near for the carrier of an interval large when the range-measurement machine which extends in order the carrier interval of the frequency used for communication between a base station and a mobile station, arranges, goes, and measures the distance of a mobile station and a base station to a base station side at the time of a line connection, and a mobile station are far.
[Claim 3] Mobile communications equipment according to claim 2 which always measures the distance of a mobile station and a base station not only with the time of a line connection but with a range-measurement vessel, and chooses the carrier according to the distance by the carrier selector.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the mobile communications method between a base station and a mobile station, and its equipment.
[0002]
[Description of the Prior Art] In recent years, the present condition is that mobile communications cannot catch up with need so then although the need is increasing rapidly, and needs to be gathering the use efficiency of frequency sharply according to it and for that there are methods, such as narrow-band-izing of a sending signal and compression of a sound signal.
[0003] Conventional mobile communications equipment is explained below. Drawing 3 shows the outline composition of the base station of conventional mobile communications equipment, and drawing 4 shows the carrier arrangement for explaining the operation, and a spectrum. In drawing 3 , the range-measurement machine with which 1 measures transmit data generators, such as Voice CODEC and FAX, and 2 measures the distance of a base station and a mobile station, and 3 are TA signal generation machines. If TA signal generation machine 3 has a long distance of a base station and a mobile station, in order that time difference will arise by the time the signal transmitted from the mobile station is received in a base station and it may absorb the difference, it needs to bring forward the transmit timing by the side of a mobile station from criteria timing according to the distance from a base station, calls the amount TA (time advance), and controls it to insert TA in a control signal, to transmit to a mobile station, and to absorb the time difference. As for the channel signal generation machine which generates the control signal for the channel allocation machine which 4 assigns a channel at the time of communication, and 5 telling a mobile station about the assigned channel, the channel use information-storage machine which memorize the channel which is using 6 now, the synthesizer which make generate the carrier which uses 7 for a strange recovery, the sending-signal composition machine which constitute 8 in the form where transmit data, a TA signal, and a channel signal can transmit, and 9, a modulator and 10 are transmitting antennas
[0004] About the mobile communications equipment constituted as mentioned above, the operation is explained below. First, when a mobile station carries out call origination, distance is measured with the range-measurement vessel 2 of a base station using the synchronizing signal contained in the demand signal transmitted from the mobile station. Moreover, when carrying out call origination from a base station, except that a call signal is first transmitted from a base station, it is the same as that of the above.
[0005] Next, TA signal with which the measured distance to a mobile station calculates which should transmit early from criteria timing, and controls a mobile station by TA signal generation machine 3 of a base station is generated. Moreover, simultaneously with it, the channel which is vacant with reference to the channel use information-storage machine 6 with the channel allocation vessel 4 is chosen, and the carrier of the channel is specified to be a synthesizer 7. Moreover, with the channel signal generation vessel 5, the control signal for telling a mobile station about the assigned channel is generated. And it constitutes from a sending-signal composition machine 8 in the form where TA signal from TA signal generation machine 3 and the control signal from the channel signal generation machine 5 can be transmitted, a modulation is applied on the carrier from a synthesizer 7 by the modulator 9, and it transmits from the transmitting antenna 10. In a mobile station, according to sent TA signal, transmit timing is shifted from criteria timing, and it transmits by the specified channel (in the case of FDMA etc., in the case of a carrier, TDMA, etc., they are a carrier and the slot number). If a channel is connected, it will communicate by inserting the signal from the transmit data generator 1 in a sending signal with the sending-signal composition vessel 8.
[0006] The carrier is arranged at intervals of [equal] X that it seems that the carrier used for the above-mentioned conventional equipment is shown in drawing 4 (a). In this case, as shown in drawing 4 (b) and (c), like [near the edge of a

cell], when the power of a contiguity wave (portion of the slash in drawing) is large and a carrier interval is taken to Y smaller than X like drawing 4 (c), interference is large, and since desired quality is not obtained, the carrier interval X has been set that there is no interference by the contiguity wave like drawing 4 (b). Moreover, like drawing 5 , since interference is small when the power of a contiguity wave is small, quality can fully be kept like [near the center of a cell].

[0007]

[Problem(s) to be Solved by the Invention] however, since it is arranged at equal intervals with the above-mentioned conventional mobile communications equipment at the size which can prevent an interference according the interval of a carrier near the edge of a cell, etc. and to contiguity waves, even when interference by the contiguity wave is small like [in case a mobile station is near the center of a cell], it is the same as the case of interference of being large -- since a ** carrier interval was needed, it had the problem produced futility in frequency

[0008] this invention solves the above-mentioned conventional problem, lessens futility of frequency, and aims at offering the outstanding mobile communications method which can increase the number of channels securable in a limited frequency band, and its equipment.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention divides into a different carrier interval the frequency band used for communication between a base station and a mobile station, and each carrier interval is used for it as a channel different, respectively.

[0010] this invention prepares two or more carrier intervals of the frequency used for communication between a base station and a mobile station again, and chooses the optimal carrier interval according to the distance of a base station and a mobile station.

[0011]

[Function] A nearby channel many can be used for this invention from the case where a carrier interval is fixed in the band restricted to the carrier with an interval narrow when a mobile station is near the center of a cell by the above-mentioned composition by assigning the latus carrier of an interval when it is in the distance.

[0012]

[Example] Hereafter, it explains, referring to a drawing about one example of this invention. Drawing 1 shows the outline composition of the base station of the mobile communications equipment in one example of this invention, and drawing 2 shows carrier arrangement and a spectrum, in order to explain the operation. In drawing 1 , the range-measurement machine with which 11 measures transmit data generators, such as Voice CODEC and FAX, and 12 measures the distance of a base station and a mobile station, and 13 are TA signal generation machines. The channel signal generation machine which generates the control signal for the channel allocation machine which 14 assigns a channel at the time of communication, and 15 telling a mobile station about the assigned channel, While generating the channel use storage machine which memorizes the channel which is using 16 now, and the carrier which uses 17 for a strange recovery The synthesizer by which two or more carrier intervals are prepared, and 18 Transmit data, It is the carrier selector which chooses the carrier interval for which a modulator should use the sending-signal composition machine constituted in the form where TA signal and a channel signal can be transmitted, and 19, and 20 should use a transmitting antenna and 21 from the distance of a base station and a mobile station.

[0013] About the mobile communications equipment constituted as mentioned above, the operation is explained below. First, when a mobile station carries out call origination, distance is measured with the range-measurement vessel 12 of a base station using the synchronizing signal contained in the demand signal transmitted from the mobile station. Moreover, when carrying out call origination from a base station, except that a call signal is first transmitted from a base station, it is the same as that of the above.

[0014] Next, TA signal with which the measured distance to a mobile station calculates which should transmit early from criteria timing, and controls a mobile station by TA signal generation machine 13 of a base station is generated. Moreover, by the carrier selector 21, according to the measured distance, when the distance of a base station and a mobile station is far, in being near, simultaneously with it, it chooses a carrier with a narrow carrier interval for a carrier with a large carrier interval. With the channel allocation vessel 14, the control signal for telling a mobile station about the channel which chose the channel which is vacant on the carrier with reference to the channel use information-storage machine 16, and specified the carrier of the channel to be a synthesizer 17, and was assigned with the channel signal generation vessel 15 is generated. And it constitutes from a sending-signal composition machine 18 in the form where TA signal from TA signal generation machine 13 and the control signal from the channel signal generation machine 15 can be transmitted, a modulation is applied on the carrier from a synthesizer 17 by the modulator 19, and it transmits from the

transmitting antenna 20. According to TA signal to which it was sent [signal] and came by the mobile station, transmit timing is shifted from criteria timing, and it transmits by the specified channel (in the case of FDMA etc., in the case of a carrier, TDMA, etc., they are a carrier and the slot number). If a channel is connected, it will communicate by inserting the signal from the transmit data generator 11 in a sending signal with the sending-signal composition vessel 18.
[0015] Next, it explains in more detail about operation of the mobile communications equipment described above using drawing 2 . First, not like regular intervals but like drawing 2 (a), the method of a low of frequency is the narrow interval Y, and the one where frequency is higher arranges a carrier at intervals of [X] latus. Since the distance with an adjoining cell is far when a mobile station is near the center of a near cell in distance with a base station, like drawing 2 (b), the power of the contiguity wave shown with a slash is small, and can maintain desired quality by Y with a small carrier interval. Since the power of a contiguity wave is large on the other hand when a mobile station is near the edge of a cell are separated [from] of distance with a base station, desired quality is not obtained unless it sets a carrier interval to large X like drawing 2 (c). Then, when it is beyond distance with the measurement result of the range-measurement machine 12, the latus carrier interval X is chosen, and when it is less than [it], the narrow carrier interval Y is chosen. When a mobile station moves, according to the position, the reassignment (channel change in a cell) of a channel is performed at any time. Many carriers (channel) can be used by this, satisfying desired quality in all carriers.
[0016] The example of the number of carriers of the mobile communications equipment by this example and the number of carriers of conventional mobile communications equipment is shown as compared with (Table 1).
[0017]
[Table 1]

項　目	本実施例	従来例
使用可能な帯域	１０ＭＨｚ　（Ａ） １５ＭＨｚ　（Ｂ）	２５ＭＨｚ
キャリア間隔	２５ｋＨｚ　（Ａ） １５ｋＨｚ　（Ｂ）	２５ｋＨｚ
キャリア数	10MHz/25KHz +15MHz/15KHz=1400	25MHz/25kHz=1000

Ａ：セルの端付近の移動局に割り当てる分
Ｂ：セルの中心付近の移動局に割り当てる分

[0018] this (Table 1) -- from -- the mobile communications equipment by this example can take many numbers of carriers compared with the conventional example, and the effect excellent in the point which can increase the channel which can be used is acquired so that clearly In addition, although the carrier interval was made into two kinds of size in the above-mentioned example, how many kinds are sufficient as this.
[0019] As mentioned above, the usable number of carriers can be increased, maintaining desired quality in all carriers by assigning the latus carrier of a carrier interval, when a carrier with a carrier interval narrow when according to this example it is not fixed, a carrier interval is carried out, the carrier selector which chooses the interval of the carrier used according to the distance of a base station and a mobile station is prepared and a mobile station is near the center of a cell is near an edge.
[0020]
[Effect of the Invention] As mentioned above, this invention divides into a different carrier interval the frequency band used for communication between a base station and a mobile station, and since each carrier interval was used for it as a channel different, respectively, it has the effect that the channel of many in the band restricted compared with the case where it divides into a single carrier interval can be used.
[0021] It has the effect that the usable number of carriers, i.e., the number of channels, can be increased, maintaining desired quality in all carriers, since this invention chose the carrier with a carrier interval large when a carrier with a carrier interval narrow when a mobile station is near the center of a cell is near an edge again according to the distance of a base station and a mobile station.

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TECHNICAL FIELD

[Industrial Application] this invention relates to the mobile communications method between a base station and a mobile station, and its equipment.

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PRIOR ART

[Description of the Prior Art] In recent years, the present condition is that mobile communications cannot catch up with need so then although the need is increasing rapidly, and needs to be gathering the use efficiency of frequency sharply according to it and for that there are methods, such as narrow-band-izing of a sending signal and compression of a sound signal.

[0003] Conventional mobile communications equipment is explained below. Drawing 3 shows the outline composition of the base station of conventional mobile communications equipment, and drawing 4 shows the carrier arrangement for explaining the operation, and a spectrum. In drawing 3 , the range-measurement machine with which 1 measures transmit data generators, such as Voice CODEC and FAX, and 2 measures the distance of a base station and a mobile station, and 3 are TA signal generation machines. If TA signal generation machine 3 has a long distance of a base station and a mobile station, in order that time difference will arise by the time the signal transmitted from the mobile station is received in a base station and it may absorb the difference, it needs to bring forward the transmit timing by the side of a mobile station from criteria timing according to the distance from a base station, calls the amount TA (time advance), and controls it to insert TA in a control signal, to transmit to a mobile station, and to absorb the time difference. As for the channel signal generation machine which generates the control signal for the channel allocation machine which 4 assigns a channel at the time of communication, and 5 telling a mobile station about the assigned channel, the channel use information-storage machine which memorize the channel which is using 6 now, the synthesizer which make generate the carrier which uses 7 for a strange recovery, the sending-signal composition machine which constitute 8 in the form where transmit data, a TA signal, and a channel signal can transmit, and 9, a modulator and 10 are transmitting antennas

[0004] About the mobile communications equipment constituted as mentioned above, the operation is explained below. First, when a mobile station carries out call origination, distance is measured with the range-measurement vessel 2 of a base station using the synchronizing signal contained in the demand signal transmitted from the mobile station. Moreover, when carrying out call origination from a base station, except that a call signal is first transmitted from a base station, it is the same as that of the above.

[0005] Next, TA signal with which the measured distance to a mobile station calculates which should transmit early from criteria timing, and controls a mobile station by TA signal generation machine 3 of a base station is generated. Moreover, simultaneously with it, the channel which is vacant with reference to the channel use information-storage machine 6 with the channel allocation vessel 4 is chosen, and the carrier of the channel is specified to be a synthesizer 7. Moreover, with the channel signal generation vessel 5, the control signal for telling a mobile station about the assigned channel is generated. And it constitutes from a sending-signal composition machine 8 in the form where TA signal from TA signal generation machine 3 and the control signal from the channel signal generation machine 5 can be transmitted, a modulation is applied on the carrier from a synthesizer 7 by the modulator 9, and it transmits from the transmitting antenna 10. In a mobile station, according to sent TA signal, transmit timing is shifted from criteria timing, and it transmits by the specified channel (in the case of FDMA etc., in the case of a carrier, TDMA, etc., they are a carrier and the slot number). If a channel is connected, it will communicate by inserting the signal from the transmit data generator 1 in a sending signal with the sending-signal composition vessel 8.

[0006] The carrier is arranged at intervals of [equal] X that it seems that the carrier used for the above-mentioned conventional equipment is shown in drawing 4 (a). In this case, as shown in drawing 4 (b) and (c), like [near the edge of a cell], when the power of a contiguity wave (portion of the slash in drawing) is large and a carrier interval is taken to Y smaller than X like drawing 4 (c), interference is large, and since desired quality is not obtained, the carrier interval X has been set that there is no interference by the contiguity wave like drawing 4 (b). Moreover, like drawing 5 , since interference is small when the power of a contiguity wave is small, quality can fully be kept like [near the center of a cell].

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, this invention divides into a different carrier interval the frequency band used for communication between a base station and a mobile station, and since each carrier interval was used for it as a channel different, respectively, it has the effect that the channel of many in the band restricted compared with the case where it divides into a single carrier interval can be used.
[0021] It has the effect that the usable number of carriers, i.e., the number of channels, can be increased, maintaining desired quality in all carriers, since this invention chose the latus carrier of a carrier interval again according to the distance of a base station and a mobile station when a carrier with a carrier interval narrow when a mobile station is near the center of a cell was near an edge.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, since it is arranged at equal intervals with the above-mentioned conventional mobile communications equipment at the size which can prevent an interference according the interval of a carrier near the edge of a cell, etc. and to contiguity waves, even when interference by the contiguity wave is small like [in case a mobile station is near the center of a cell], it is the same as the case of interference of being large -- since a ** carrier interval was needed, it had the problem produced futility in frequency

[0008] this invention solves the above-mentioned conventional problem, lessens futility of frequency, and aims at offering the outstanding mobile communications method which can increase the number of channels securable in a limited frequency band, and its equipment.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention divides into a different carrier interval the frequency band used for communication between a base station and a mobile station, and each carrier interval is used for it as a channel different, respectively.
[0010] this invention prepares two or more carrier intervals of the frequency used for communication between a base station and a mobile station again, and chooses the optimal carrier interval according to the distance of a base station and a mobile station.

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OPERATION

[Function] A nearby channel many can be used for this invention from the case where a carrier interval is fixed in the band restricted to the carrier with an interval narrow when a mobile station is near the center of a cell by the above-mentioned composition by assigning a carrier with an interval large when it is in the distance.

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EXAMPLE

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[0013] About the mobile communications equipment constituted as mentioned above, the operation is explained below. First, when a mobile station carries out call origination, distance is measured with the range-measurement vessel 12 of a base station using the synchronizing signal contained in the demand signal transmitted from the mobile station. Moreover, when carrying out call origination from a base station, except that a call signal is first transmitted from a base station, it is the same as that of the above.
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[0015] Next, it explains in more detail about operation of the mobile communications equipment described above using drawing 2 . First, not like regular intervals but like drawing 2 (a), it is the narrow interval Y and, in the one where frequency is higher, the one where frequency is lower arranges a carrier at intervals of [large] X. Since the distance with an adjoining cell is far when a mobile station is near the center of a near cell in distance with a base station, like drawing 2 (b), the power of the contiguity wave shown with a slash is small, and can maintain desired quality by Y with a small carrier interval. Since the power of a contiguity wave is large on the other hand when a mobile station is near the edge of a cell are separated [from] of distance with a base station, desired quality is not obtained unless it sets a carrier interval to large X like drawing 2 (c). Then, the carrier interval X large when it is beyond distance with the measurement result of the range-measurement machine 12 is chosen, and when it is less than [it], the narrow carrier interval Y is chosen. When a mobile station moves, according to the position, the reassignment (channel change in a cell) of a channel is performed at any time. Many carriers (channel) can be used by this, satisfying desired quality in all carriers.

[0016] The example of the number of carriers of the mobile communications equipment by this example and the number of carriers of conventional mobile communications equipment is shown as compared with (Table 1).

[0017]

[Table 1]

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[0019] As mentioned above, the usable number of carriers can be increased, maintaining desired quality in all carriers by assigning the latus carrier of a carrier interval, when a carrier with a carrier interval narrow when according to this example it is not fixed, a carrier interval is carried out, the carrier selector which chooses the interval of the carrier used according to the distance of a base station and a mobile station is prepared and a mobile station is near the center of a cell is near an edge.

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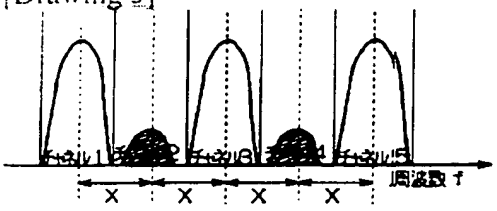
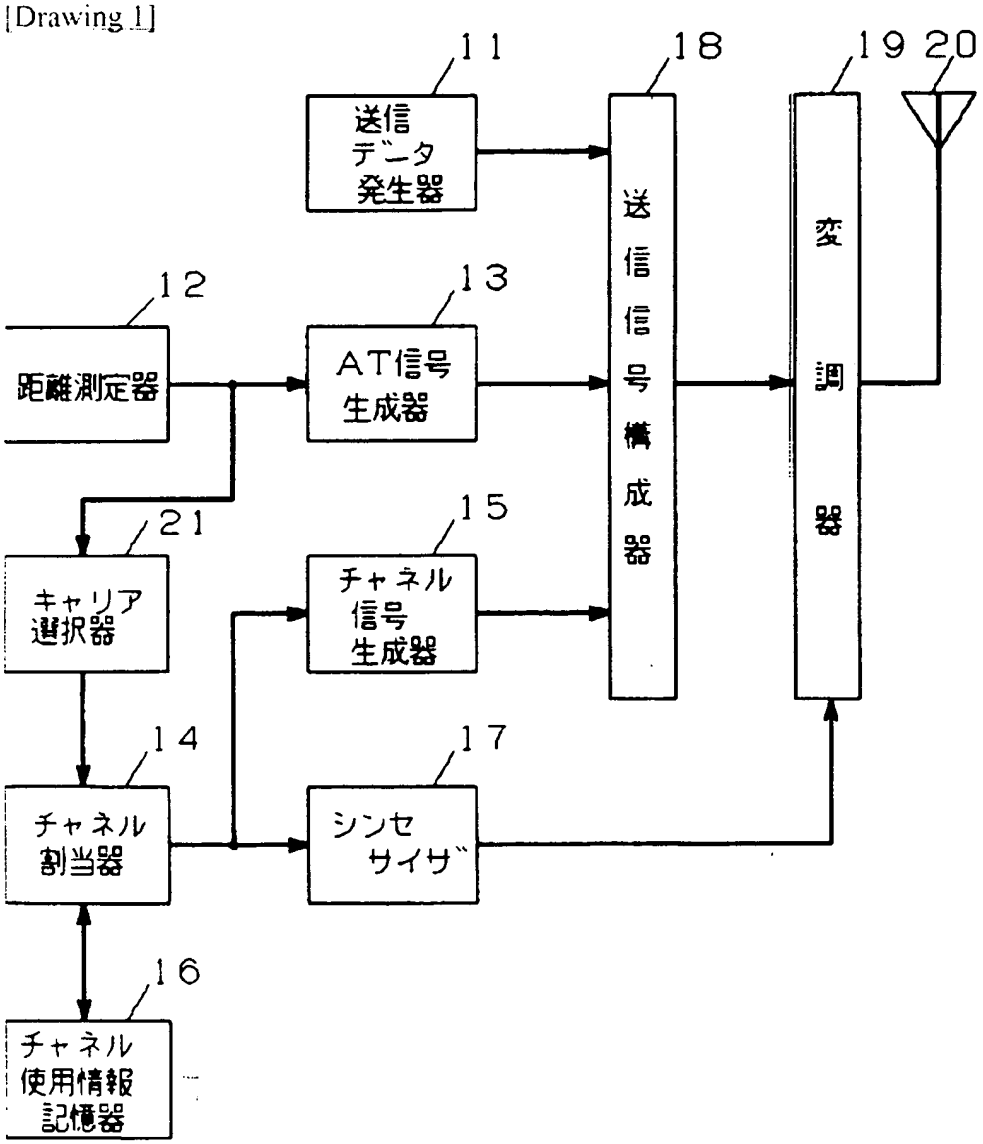
DRAWINGS

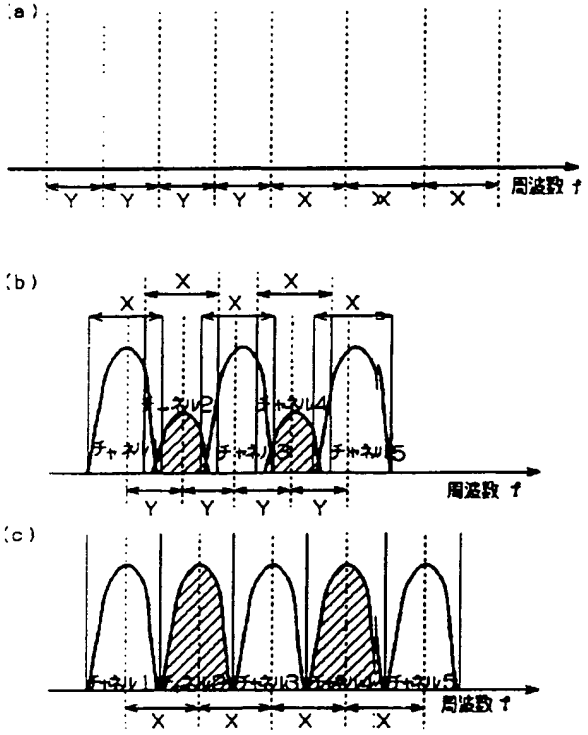
[Drawing 5]



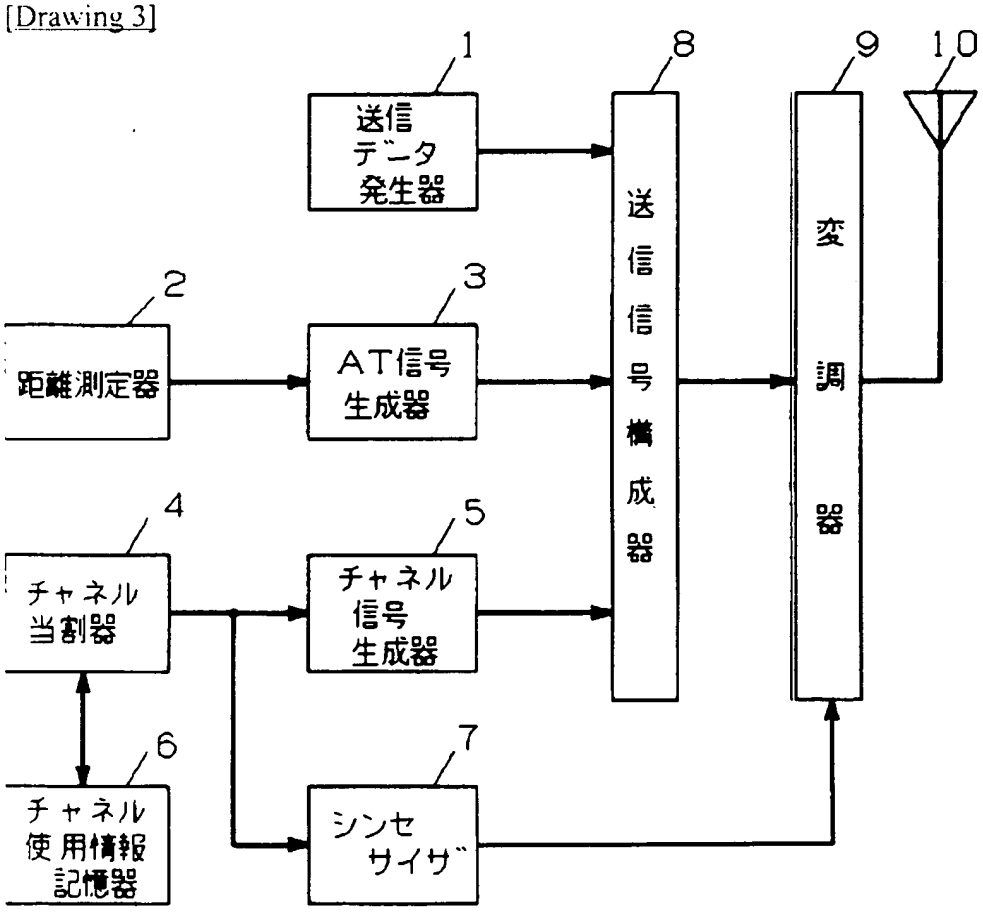
[Drawing 1]



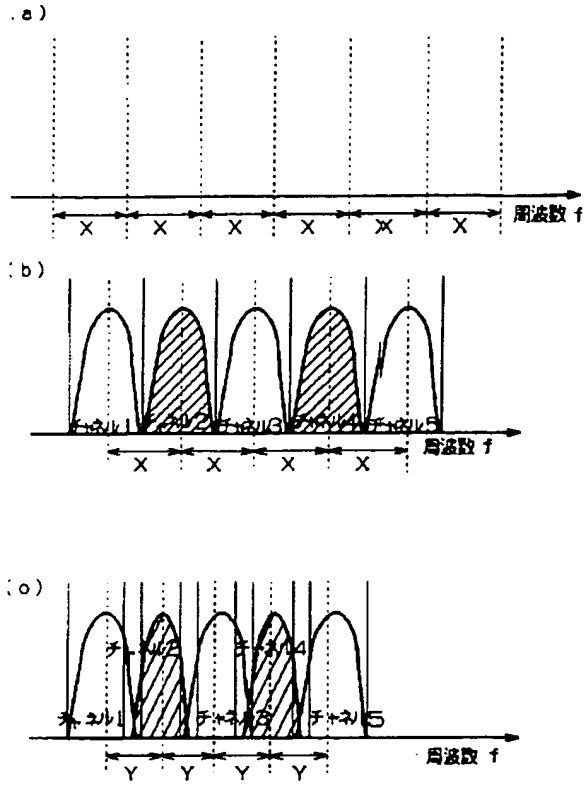
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]

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US-CL-CURRENT: 370/485, 370/FOR.128 , 455/62 , 455/517

ABSTRACT:

PURPOSE: To increase number of channels secured in a definite range of frequency band by dividing the frequency band into different carrier intervals and using each carrier interval for different channels.

CONSTITUTION: A carrier selector 21 selects carriers with a wide carrier interval when a distance between a base station and a mobile station is remote and selects carriers with a narrow carrier interval when the distance is small based on the measured distance. That is, the carrier selector 21 makes the carrier interval not constant and selects the carrier interval in use depending on the distance between the base station and the mobile station. When the mobile station is resident around the center of the cell, the carriers with a narrow carrier interval are selected and when the mobile station is resident around the edge of the cell, the carriers with a wide carrier interval are

**selected thereby increasing number of available carriers while keeping desired
quality in all the carriers.**

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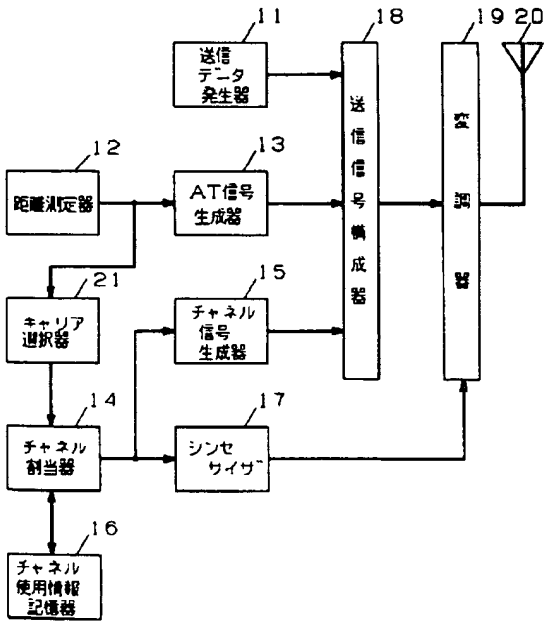
(54)【発明の名称】　移動通信方法およびその装置

(57)【要約】

【目的】　移動通信を行なう場合に、使用できる周波数帯を異なったキャリア間隔に分割し、基地局と移動局の距離に応じて使い分けることにより、全キャリアで所望品質を保ったまま、使用できるキャリア（チャネル）数を増やす。

【構成】　基地局と移動局の距離を測定する距離測定器１２と、その距離に応じたキャリア間隔のキャリアを選択するキャリア選択器２１とを設け、距離が離れている場合は隣接波の干渉を受け易いのでキャリア間隔の大きいキャリアを選択して品質を確保し、距離が小さい場合には隣接波の干渉が小さいのでキャリア間隔の小さいキャリアを選択してチャネル数を増やす。



05/17/2003, EAST Version: 1.03.0002

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【特許請求の範囲】

【請求項１】　基地局と移動局間の通信に使用する周波数帯を異なったキャリア間隔に分割し、各キャリア間隔をそれぞれ異なったチャネルとして使用する移動通信方法。

【請求項２】　基地局と移動局間の通信に使用する周波数のキャリア間隔を順に広げて配置して行き、基地局側に、回線接続時に移動局と基地局の距離を測定する距離測定器と、移動局が遠い場合は大きい間隔のキャリアを、近い場合は小さい間隔のキャリアを割り当てるキャリア選択器とを備えた移動通信装置。

【請求項３】　回線接続時だけでなく、距離測定器により常に移動局と基地局の距離を測定し、キャリア選択器によりその距離に応じたキャリアを選択する請求項２記載の移動通信装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、基地局と移動局との間の移動通信方法およびその装置に関するものである。

【０００２】

【従来の技術】近年、移動通信はその需要が急激に増加しており、それに応じて周波数の利用効率を大幅に上げる必要が生じており、そのためには、送信信号の狭帯域化や音声信号の圧縮などの方法があるが、それだけでは需要に追いつけないのが現状である。

【０００３】以下に従来の移動通信装置について説明する。図３は従来の移動通信装置の基地局の概略構成を示すものであり、図４はその動作を説明するためのキャリア配置とスペクトルを示したものである。図３において、１は音声ＣＯＤＥＣ、ＦＡＸなどの送信データ発生器、２は基地局と移動局の距離を測定する距離測定器、３はＴＡ信号生成器である。ＴＡ信号生成器３は、基地局と移動局の距離が長いと、移動局から送信した信号が基地局で受信されるまでに時間差が生じ、その差を吸収するため、移動局側の送信タイミングを基地局からの距離に応じて、基準タイミングから早める必要があり、その量をＴＡ（タイムアドバンス）と呼び、ＴＡを制御信号に挿入して移動局に送信してその時間差を吸収するように制御する。４は通信時にチャネルを割り当てるチャネル割当器、５は割り当てたチャネルを移動局に知らせるための制御信号を生成するチャネル信号生成器、６は現在使用しているチャネルを記憶しておくチャネル使用情報記憶器、７は変復調に用いるキャリアを発生させるシンセサイザ、８は送信データ、ＴＡ信号およびチャネル信号を送信できる形に構成する送信信号構成器、９は変調器、１０は送信アンテナである。

【０００４】以上のように構成された移動通信装置について、以下その動作について説明する。まず、移動局が発呼する場合は、移動局から送信された要求信号中に含まれる同期信号などを用いて基地局の距離測定器２で距離を測定する。また、基地局から発呼する場合も、最初に基地局から呼出信号が送信される以外は上記と同様である。

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【０００５】次に、基地局のＴＡ信号生成器３では、測定した距離から移動局が基準タイミングからどれだけ早く送信を行なえば良いかを計算して移動局を制御するＴＡ信号を生成する。またそれと同時に、チャネル割当器４でチャネル使用情報記憶器６を参照して空いているチャネルを選び、シンセサイザ７にそのチャネルのキャリアを指定する。また、チャネル信号生成器５では、割り当てたチャネルを移動局に知らせるための制御信号を生成する。そして、送信信号構成器８では、ＴＡ信号生成器３からのＴＡ信号とチャネル信号生成器５からの制御信号とを送信できる形に構成し、変調器９でシンセサイザ７からのキャリアで変調をかけ、送信アンテナ１０から送信する。移動局では、送られてきたＴＡ信号に従って送信タイミングを基準タイミングからずらし、指定されたチャネル（ＦＤＭＡなどの場合はキャリア、ＴＤＭＡなどの場合はキャリアとスロット番号）により送信を行なう。チャネルがつながったら、送信データ発生器１からの信号を送信信号構成器８で送信信号に挿入して通信を行なう。

【０００６】上記従来の装置に使用されるキャリアは、図４（ａ）に示すように等しい間隔Ｘでキャリアが配置されている。この場合、図４（ｂ）、（ｃ）のように、セルの端付近などのように、隣接波（図中の斜線の部分）のパワーが大きい場合には、図４（ｃ）のようにキャリア間隔をＸより小さいＹにとると干渉が大きく、所望の品質が得られないので、図４（ｂ）のように、隣接波による干渉がないようにキャリア間隔Ｘを定めてある。また、図５のように、セルの中心付近などのように、隣接波のパワーが小さい場合には、干渉が小さいので品質を十分に保つことができる。

【０００７】

【発明が解決しようとする課題】しかしながら、上記従来の移動通信装置では、キャリアの間隔を、セルの端付近などでも隣接波による干渉を防止できるような広さに等間隔に配置されているので、移動局がセルの中心付近にいる場合のように隣接波による干渉の小さい場合でも、干渉の大きい場合と同じだけキャリア間隔を必要とするため、周波数に無駄を生じるという問題を有していた。

【０００８】本発明は、上記従来の問題を解決するものであり、周波数の無駄を少なくして、有限の周波数帯域内に確保できるチャネル数を増やすことができる優れた移動通信方法およびその装置を提供することを目的とする。

【０００９】

【課題を解決するための手段】本発明は、上記目的を達成するために、基地局と移動局間の通信に使用する周波

数帯を異なったキャリア間隔に分割し、各キャリア間隔をそれぞれ異なったチャネルとして使用するようにしたものである。

【００１０】本発明はまた、基地局と移動局間の通信に使用する周波数のキャリア間隔を複数用意して、基地局と移動局の距離に応じて最適なキャリア間隔を選択するようにしたものである。

【００１１】

【作用】本発明は、上記構成によって、例えば移動局がセルの中心付近にいる場合は間隔の狭いキャリアに、遠くにいる場合は間隔の広いキャリアに割り当てることによって、限られた帯域内でキャリア間隔を一定にした場合よりもより多くのチャネルを使用することができる。

【００１２】

【実施例】以下、本発明の一実施例について図面を参照しながら説明する。図１は本発明の一実施例における移動通信装置の基地局の概略構成を示すもので、図２はその動作を説明するためにキャリア配置とスペクトルを示したものである。図１において、１１は音声ＣＯＤＥＣ、ＦＡＸなどの送信データ発生器、１２は基地局と移動局の距離を測定する距離測定器、１３はＴＡ信号生成器である。１４は通信時にチャネルを割り当てるチャネル割当器、１５は割り当てたチャネルを移動局に知らせるための制御信号を生成するチャネル信号生成器、１６は現在使用しているチャネルを記憶しておくチャネル使用情報記憶器、１７は変復調に用いるキャリアを発生させるとともに、複数のキャリア間隔が用意されているシンセサイザ、１８は送信データ、ＴＡ信号およびチャネル信号を送信できる形に構成する送信信号構成器、１９は変調器、２０は送信アンテナ、２１は基地局と移動局の距離から使用すべきキャリア間隔を選択するキャリア選択器である。

【００１３】以上のように構成された移動通信装置について、以下その動作について説明する。まず、移動局が発呼する場合は、移動局から送信された要求信号中に含まれる同期信号などを用いて基地局の距離測定器１２で距離を測定する。また、基地局から発呼する場合も、最初に基地局から呼出信号が送信される以外は上記と同様である。

【００１４】次に、基地局のＴＡ信号生成器１３では、測定した距離から移動局が基準タイミングからどれだけ早く送信を行なえば良いかを計算して移動局を制御するＴＡ信号を生成する。またそれと同時に、キャリア選択器２１では、測定した距離に応じて、基地局と移動局の距離が遠い場合にはキャリア間隔が広いキャリアを、近い場合にはキャリア間隔が狭いキャリアを選択する。チャネル割当器１４では、チャネル使用情報記憶器１６を参照して、そのキャリア上で空いているチャネルを選び、シンセサイザ１７にそのチャネルのキャリアを指定し、またチャネル信号生成器１５では、割り当てたチャネルを移動局に知らせるための制御信号を生成する。そして、送信信号構成器１８では、ＴＡ信号生成器１３からのＴＡ信号とチャネル信号生成器１５からの制御信号とを送信できる形に構成し、変調器１９でシンセサイザ１７からのキャリアで変調をかけ、送信アンテナ２０から送信する。移動局では、送られきたＴＡ信号に従って送信タイミングを基準タイミングからずらし、指定されたチャネル（ＦＤＭＡなどの場合はキャリア、ＴＤＭＡなどの場合はキャリアとスロット番号）により送信を行なう。チャネルがつながったら、送信データ発生器１１からの信号を送信信号構成器１８で送信信号に挿入して通信を行なう。

【００１５】次に、図２を用いて上記した移動通信装置の動作についてさらに詳しく説明する。まず、キャリアを等間隔でなく、図２（ａ）のように、例えば周波数の低い方は狭い間隔Ｙで、周波数の高い方は広い間隔Ｘで配置する。移動局が基地局との距離が近いセルの中心付近にいる場合は、隣接のセルとの距離は遠いために、図２（ｂ）のように、斜線で示す隣接波のパワーは小さく、キャリア間隔が小さいＹで所望の品質が保てる。一方、移動局が基地局との距離が離れているセルの端付近にいる場合には、隣接波のパワーが大きいため、図２（ｃ）のようにキャリア間隔を大きいＸにしないと所望の品質が得られない。そこで、距離測定器１２の測定結果がある距離以上であった場合には、広いキャリア間隔Ｘを選び、それ以下であった場合には、狭いキャリア間隔Ｙを選ぶ。移動局が移動した場合は、その位置に応じて、チャネルの再割当（セル内チャネル切り替え）を随時行なう。このことにより、全キャリアにおいて所望の品質を満足させつつ、多くのキャリア（チャネル）を使用することができる。

【００１６】本実施例による移動通信装置のキャリア数と従来の移動通信装置のキャリア数の例を（表１）に比較して示している。

【００１７】

【表１】

項　目	本実施例	従来例
使用可能な帯域	１０ＭＨｚ　（Ａ） １５ＭＨｚ　（Ｂ）	２５ＭＨｚ
キャリア間隔	２５ｋＨｚ　（Ａ） １５ｋＨｚ　（Ｂ）	２５ｋＨｚ
キャリア数	10MHz/25KHz +15MHz/15KHz=1400	25MHz/25kHz=1000

Ａ：セルの端付近の移動局に割り当てる分

Ｂ：セルの中心付近の移動局に割り当てる分

【００１８】この（表１）から明らかなように、本実施例による移動通信装置は、キャリア数を従来例に比べて多くとれ、使用できるチャネルを増やせる点で優れた効果が得られる。なお、上記実施例ではキャリア間隔を大小２種類としたが、これは何種類でも良い。

【００１９】以上のように、本実施例によれば、キャリア間隔を一定でなくし、基地局と移動局の距離に応じて使用するキャリアの間隔を選択するキャリア選択器を設け、移動局がセルの中心付近にいる場合にはキャリア間隔の狭いキャリアを、端付近にいる場合にはキャリア間隔の広いキャリアを割り当てることにより、全キャリアにおいて所望の品質を保ちつつ、使用可能なキャリア数を増やすことができる。

【００２０】

【発明の効果】以上のように、本発明は、基地局と移動局間の通信に使用する周波数帯を異なったキャリア間隔に分割し、各キャリア間隔をそれぞれ異なったチャネルとして使用するようにしたので、単一のキャリア間隔に分割した場合に比べて限られた帯域内でより多くのチャネルを使用することができるという効果を有する。

【００２１】本発明はまた、基地局と移動局の距離に応じて、移動局がセルの中心付近にいる場合にはキャリア間隔の狭いキャリアを、端付近にいる場合にはキャリア間隔の広いキャリアを選択するようにしたので、全キャリアにおいて所望の品質を保ちつつ、使用可能なキャリア数すなわちチャネル数を増やすことができるという効果を有する。

＊【図面の簡単な説明】

【図１】本発明の一実施例における移動通信装置の基地局の概略構成を示すブロック図

【図２】（ａ）同装置におけるキャリア配置図

（ｂ）同装置におけるセルの中心付近のスペクトル図

（ｃ）同装置におけるセルの端付近のスペクトル図

【図３】従来の移動通信装置の基地局の概略構成を示すブロック図

【図４】（ａ）同装置におけるキャリア配置図

（ｂ）同装置における隣接波のパワーが大きい場合のスペクトル図

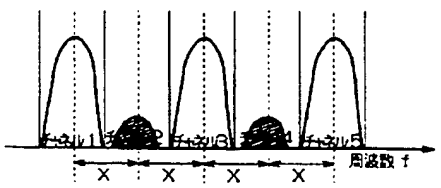
（ｃ）同装置におけるキャリア間隔を狭めた場合のスペクトル図

【図５】同装置における隣接波のパワーが小さい場合のスペクトル図

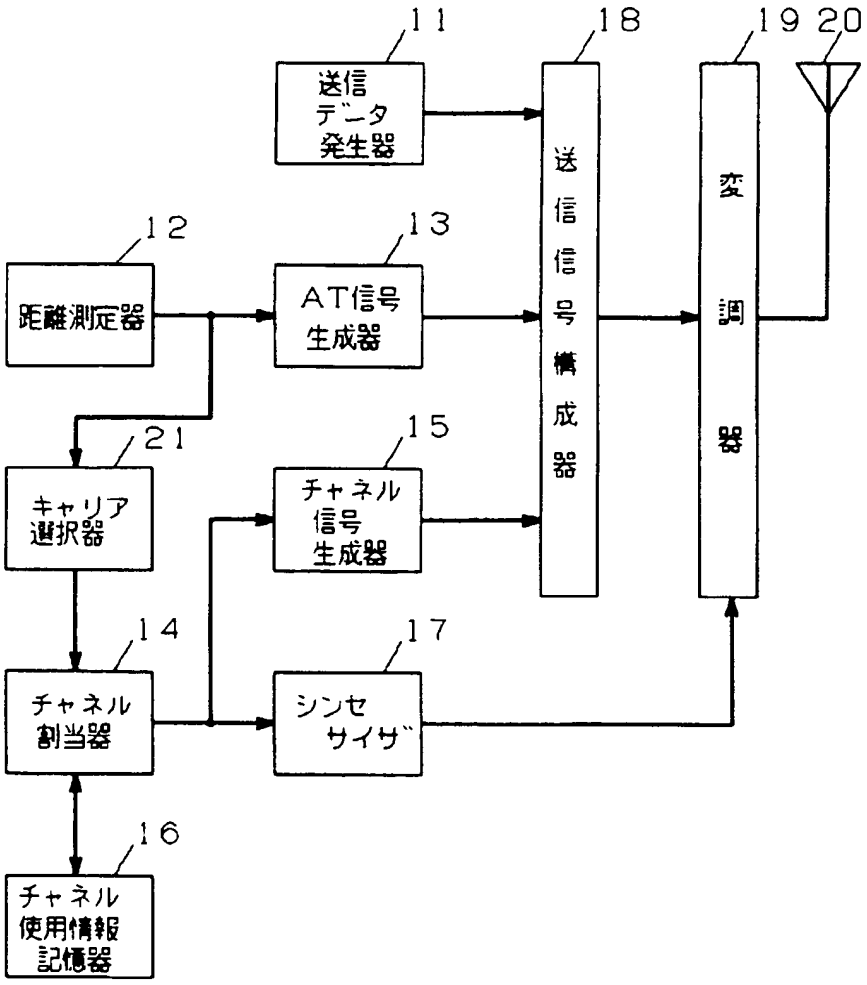
【符号の説明】

１１　送信データ発生器
１２　距離測定器
１３　ＴＡ信号生成器
１４　チャネル割当器
１５　チャネル信号生成器
１６　チャネル使用情報記憶器
１７　シンセサイザ
１８　送信信号構成器
１９　変調器
２０　送信アンテナ
２１　キャリア選択器

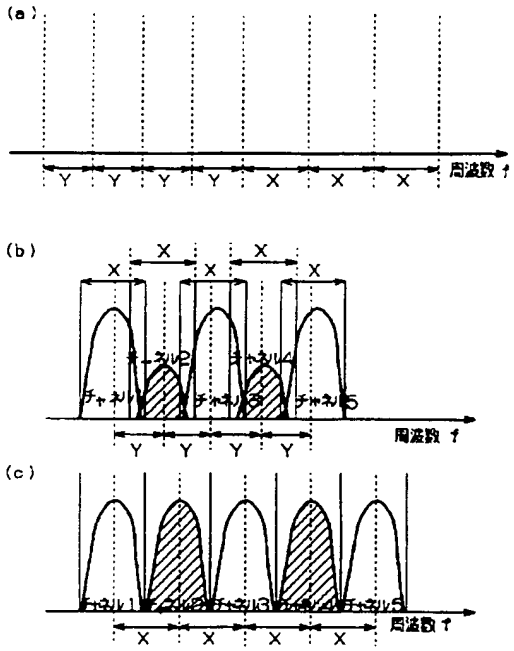
【図５】



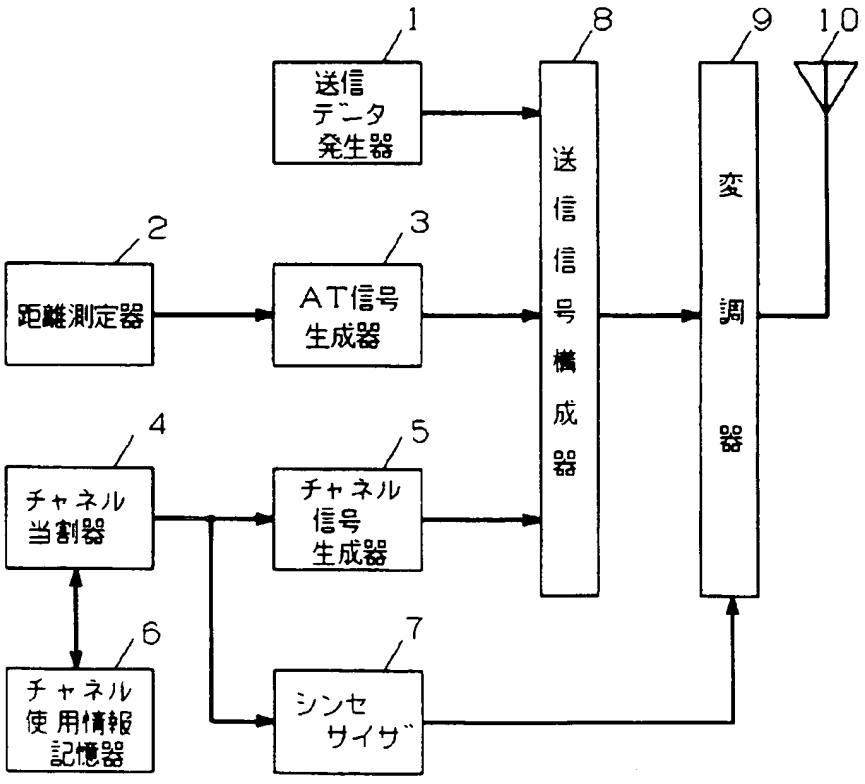
【図1】


11
18
19 20
送信データ発生器
送信信号構成器
変調器
12
13
距離測定器
AT信号生成器
21
15
キャリア選択器
チャネル信号生成器
14
17
チャネル割当器
シンセサイザ
16
チャネル使用情報記憶器

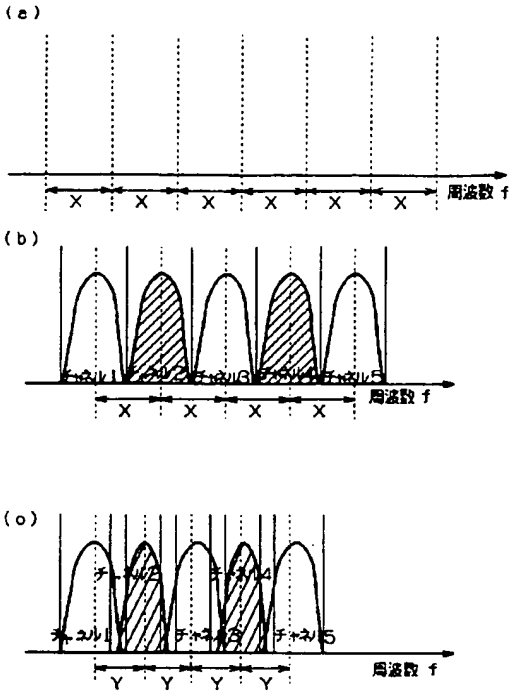
【図2】


(a)
Y Y Y Y X X X
周波数 f
(b)
X X X X X
チャネル1
チャネル2
チャネル3
チャネル4
チャネル5
Y Y Y Y
周波数 f
(c)
チャネル1
チャネル5
X X X X
周波数 f

【図3】


1
送信データ発生器
2
距離測定器
3
AT信号生成器
4
チャネル当割器
5
チャネル信号生成器
6
チャネル使用情報記憶器
7
シンセサイザ
8
送信信号構成器
9
変調器
10

【図4】



フロントページの続き

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